SCOTTS LAWN TRACTORS



TECHNICAL MANUAL

PREVIEW - YOUFIXTHIS.COM

TM1776 (21Nov00)

Replaces TM1776 (29Feb00)

Litho in English

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This technical manual is written for an experienced technician and contains sections that are specifically for this product. It is a part of a total product support program.

The manual is organized so that all the information on a particular system is kept together. The order of grouping is as follows:

- Table of Contents
- Specifications
- Component Location
- System Schematic
- Theory of Operation
- Troubleshooting Chart
- Diagnostics
- Tests & Adjustments
- Repair

Note: Depending on the particular section or system being covered, not all of the above groups may be used.

Each section will be identified with a symbol rather than a number. The groups and pages within a section will be consecutively numbered.

We appreciate your input on this manual. If you find any errors, or want to comment on the layout of the manual, please mail your comments back to us.

All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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Safety
Specifications and Information
Engine–Briggs & Stratton
Engine–Kohler
Engine–Briggs & Stratton V-Twin
Electrical System
Gear Power Train
Hydrostatic Power Train K51
Steering
Attachments
Miscellaneous M

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SAFETY

RECOGNIZE SAFETY INFORMATION



This is the safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

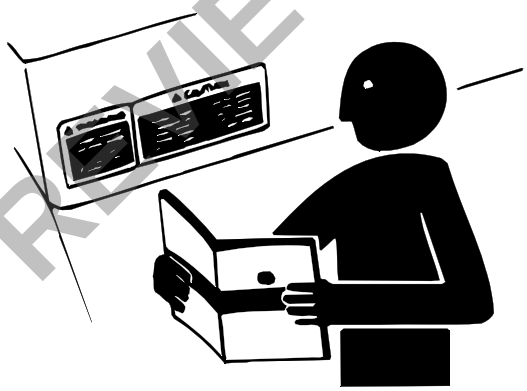
Follow recommended precautions and safe servicing practices.

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

REPLACE SAFETY SIGNS



Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

HANDLE FLUIDS SAFELY-AVOID FIRES

Be Prepared For Emergencies



When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

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SPECIFICATIONS

Engine (Kohler Single Cylinder):

Make . . . . . Kohler
Style . . . . . Vertical Shaft
Model . . . . . Command 16 QT - CV16S-43518
. . . . . (S/N 35001–) CV16S-43526
Power . . . . . 11.93 kW (16.0 hp)
Displacement . . . . . 426 cm^3 (26.0 cu-in.)
Type . . . . . Gasoline, Air Cooled, Single Cylinder, 4-Cycle
Lubrication . . . . . Fully Pressurized
Crankcase Oil Capacity
without oil filter . . . . . 1.8 L (1.9 qt)
with oil filter . . . . . 1.9 L (2.0 qt)
Oil: Warm Climate (Above 40°F) . . . . . SE, SF, SG, SAE 30W
Cold Climate (Below 40°F) . . . . . SE, SF, SG, SAE 10W30
Ignition System . . . . . Magneto Ignition
Magneto Air Gap . . . . . 0.2 – 0.3 mm (0.008 – 0.012 in.)
Charging System . . . . . Dual Circuit (AC/DC)
Charging Capacity . . . . . 3 amps, 14 volts DC@3350 rpm (regulated)
Spark Plugs . . . . . M78543 (Champion RC-12 YC)
Spark Plug Air Gap . . . . . 0.76 mm (0.030 in.)
Starter Type . . . . . Bendix Inertia Drive
Fuel Shutoff Solenoid . . . . . Replaceable (Below Carburetor Float Bowl)

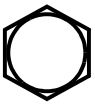
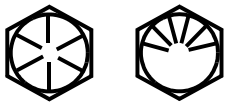
Engine (Briggs & Stratton Single Cylinder):

Make . . . . . Briggs and Stratton
Style . . . . . Vertical Shaft
Model 311777
Power . . . . . 12.6 kW (17 hp)
Displacement . . . . . 508 cm^3 (31.0 cu-in.)
Type . . . . . Gasoline, Air Cooled, Single Cylinder, 4-Cycle
Lubrication . . . . . Splash type with filtration
Crankcase Oil Capacity
without oil filter . . . . . 1.42 L (1.5 qt)
with oil filter . . . . . 1.66 L (1.75 qt)
Oil: Warm Climate (Above 4°C (40°F)) . . . . . SE, SF, SG, SAE 30W
Cold Climate (Below 4°C (40°F)) . . . . . SE, SF, SG, SAE 10W30
Ignition System . . . . . Magnetron® Magneto Ignition
Magneto Air Gap . . . . . 0.25 – 0.35 mm (0.010 - 0.014 in.)
Charging System . . . . . Dual Circuit (AC/DC)
Charging Capacity . . . . . 2 – 4 amps, 14 volts DC@3300 rpm (Unregulated)
Spark Plugs . . . . . M78543 (Champion RC-12 YC)
Spark Plug Air Gap . . . . . 0.76 mm (0.030 in.)
Starter Type . . . . . Bendix Inertia Drive
Fuel Shutoff Solenoid . . . . . Replaceable (Below Carburetor Float Bowl)

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INCH TORQUE VALUES

SAE Grade and Head Markings	**No Marks** 		
SAE Grade and Nut Markings	**No Marks** 		

Size	Grade 1				Grade 2[b]				Grade 5, 5.1 or 5.2				Grade 8 or 8.2			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
1/4	3.8	2.8	4.7	3.5	6	4.4	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.7	9.8	7.2	12	9	15.5	11.5	19.5	14.5	25	18.5	28	20.5	35	26
3/8	13.5	10	17.5	13	22	16	27.5	20	35	26	44	32.5	49	36	63	46
7/16	22	16	28	20.5	35	26	44	32.5	56	41	70	52	80	59	100	74
1/2	34	25	42	31	53	39	67	49	85	63	110	80	120	88	155	115
9/16	48	35.5	60	45	76	56	95	70	125	92	155	115	175	130	220	165
5/8	67	49	85	63	105	77	135	100	170	125	215	160	240	175	305	225
3/4	120	88	150	110	190	140	240	175	300	220	380	280	425	315	540	400
7/8	190	140	240	175	190	140	240	175	490	360	615	455	690	510	870	640
1	285	210	360	265	285	210	360	265	730	540	920	680	1030	760	1300	960
1-1/8	400	300	510	375	400	300	510	375	910	670	1150	850	1450	1075	1850	1350
1-1/4	570	420	725	535	570	420	725	535	1280	945	1630	1200	2050	1500	2600	1920
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2140	1580	2700	2000	3400	2500
1-1/2	990	730	1250	930	990	730	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head.

Tighten toothed or serrated-type lock nuts to the full torque value.

[a] *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.*
"Dry" means plain or zinc plated without any lubrication.

[b] *Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6 in.) long. Grade 1 applies for hex cap screws over 152 mm (6 in.) long, and for all other types of bolts and screws of any length.*

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TROUBLESHOOTING

Problem or Symptom / Check or Solution	Engine will not crank	Engine cranks but will not start	Engine starts hard	Engine won't shutoff	Loss of power	Low compression	Excessive engine noise/vibration	Low oil pressure	Engine overheats	Fuel mixture too rich
Battery has low or no charge/ cables loose or dirty	●	●	●							
Fusible link (F1) open	●									
Starter motor/solenoid defective	●									
Improper switch position (See Electrical Section)	●	●								
Engine seized	●									
Fuel shutoff solenoid defective		●		●						
Fuel filter/lines clogged		●	●		●					
Fuel pump defective		●	●		●					
Ignition armature air gap not adjusted properly		●	●		●					
Carburetor not adjusted properly, dirty		●	●	●	●				●	●
Air cleaner dirty		●	●		●					●
Old/contaminated fuel		●	●		●					
Spark plugs loose/dirty		●	●		●	●				
Magneto kill circuit grounded/ shorted (See Electrical Section)		●								
Valve tappets need adjustment		●	●		●	●				
Lack of compression, check valves, pistons and rings		●	●		●					
Magneto kill circuit open (See Electrical Section)				●						
Mower deck binding or dragging					●		●		●	
Grass build-up under deck					●		●		●	

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READING ELECTRICAL SCHEMATICS

The schematic is made up of individual circuits laid out in a sequence of related functions. It is formatted with all power wires (A) across the top and all ground wires (B) across the bottom. Current flow is generally from top to bottom through each circuit and component. All components are shown in the OFF position. The diagram does not list connector (C) information unless needed to avoid confusion. If the connector is shown, the number next to it is the terminal pin location (D) in the connector.

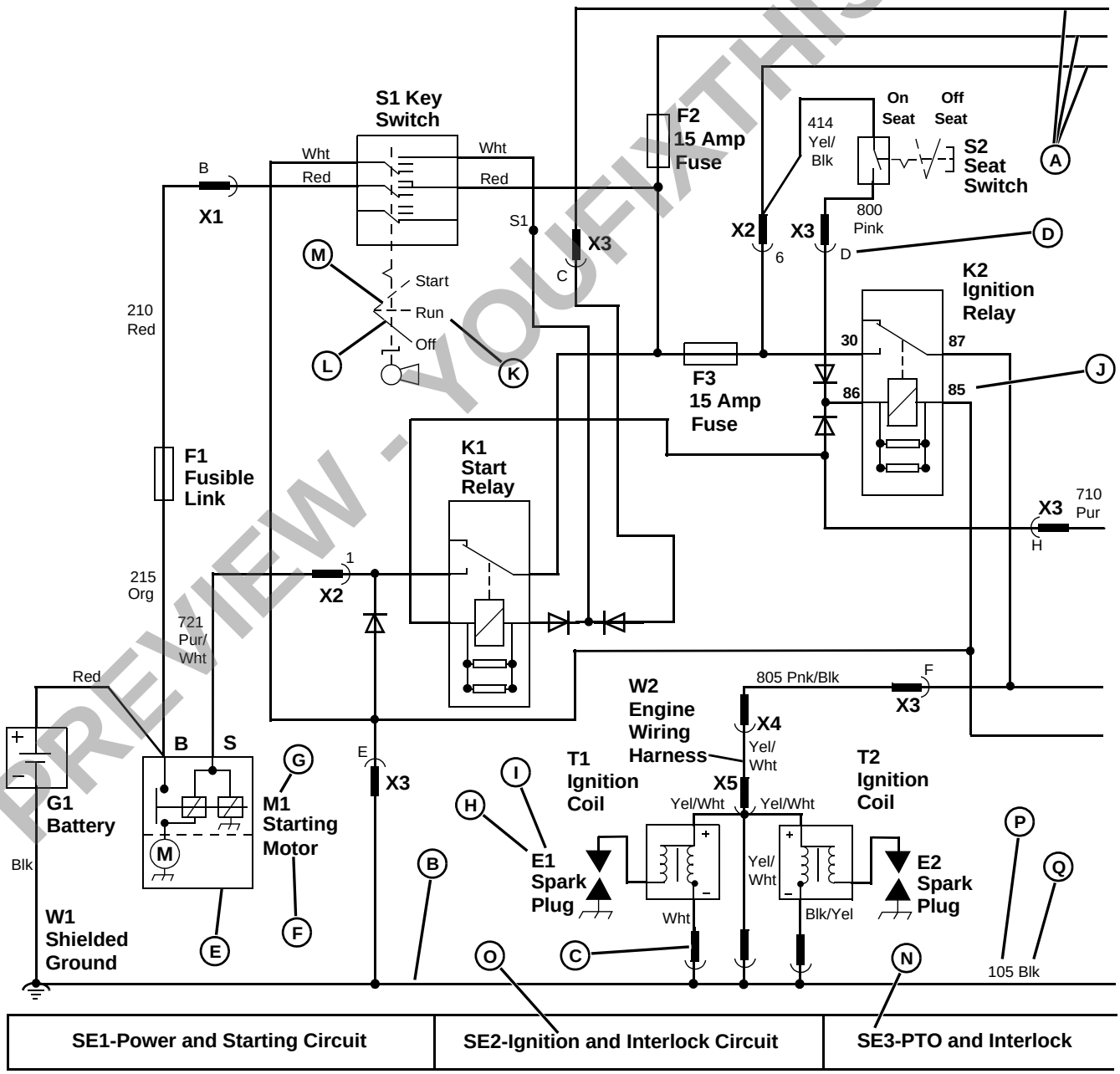
Each component is shown by a symbol (E), its name (F), and an identification code (G). The identification code contains a device identifying letter (H) and number (I).

The identifying letter is always the same for a specific component, but the identifying numbers are numbered consecutively from upper left to lower right. The terminal designation (J) is placed directly outside the symbol next to the connecting wire path. Switch positions (K) are also placed directly outside the symbol. The solid line (L) shows the position the switch is currently in and dash lines (M) represent other switch positions.

Each circuit is identified at the bottom of the drawing by a section number (N) and section name (O).

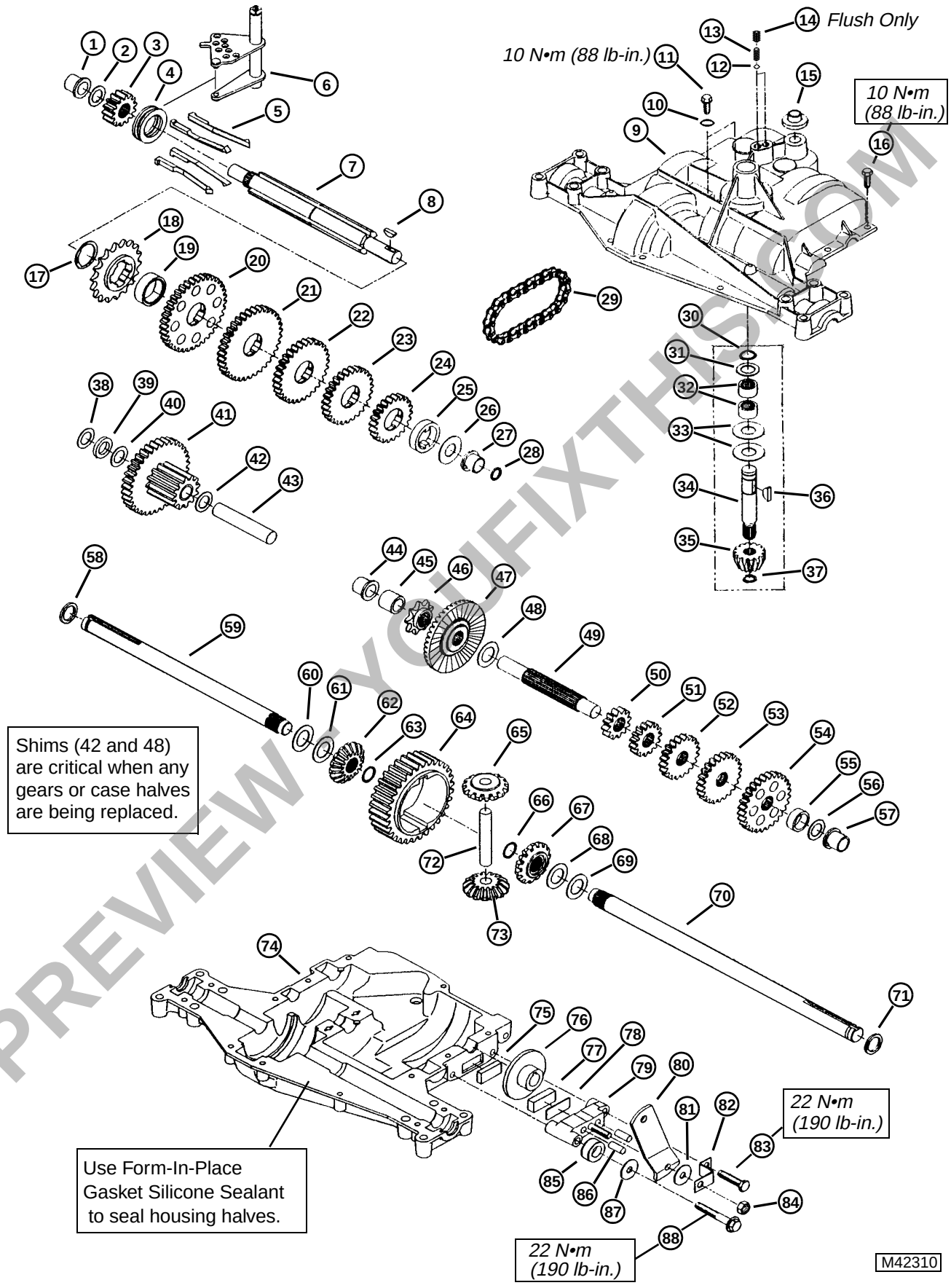
The circuit number (P) and wire color (Q) of the wires are shown directly next to the wire path.

The same component name and identification code are used consistently on all diagrams in this section. Components can be easily cross-referenced.



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TRANSAXLE COMPONENT LOCATION



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TESTS AND ADJUSTMENTS

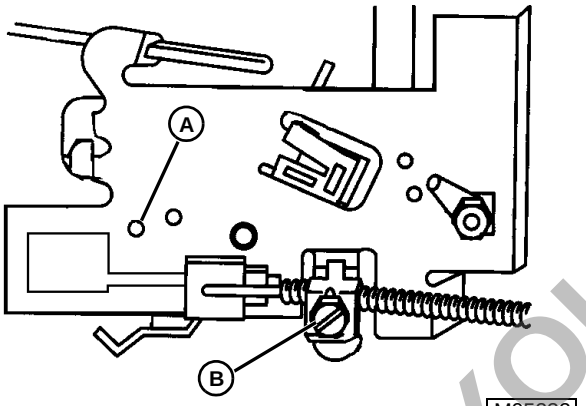
THROTTLE CABLE ADJUSTMENT

Reason:

To make sure the throttle cable moves the throttle through its full range of movement.

Procedure:

1. Move throttle lever to FAST idle position.



M95232

2. Hole in governor control lever must align with hole (A) in governor control plate.
3. Loosen throttle cable clamp (B).
4. Slide the throttle cable left or right to align holes.
5. Tighten throttle cable clamp.

FUEL SHUTOFF SOLENOID TEST

Reason:

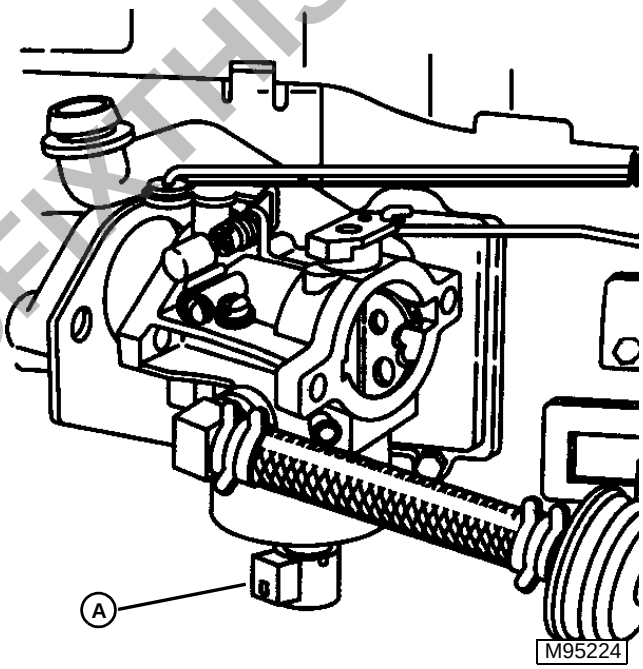
To test proper operation of fuel shutoff solenoid.

Required Tools:

- Jumper wire

Procedure:

1. Listen for an audible click when ignition switch is turned from OFF to ON.
2. If solenoid does not click, problem could be in equipment wiring.



M95224

3. Disconnect wire from solenoid (A).
4. Momentarily place a jumper wire from solenoid wire to battery positive terminal.
5. If solenoid now clicks, the solenoid is working properly.

NOTE: If battery voltage drops below 9 volts when cranking engine or while engine is running, the solenoid will not function.

Results:

- Solenoid is operating properly if a click is heard when ignition switched from OFF to ON.

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Numerics

42 Inch Deck 10-4
46 Inch Deck 10-5

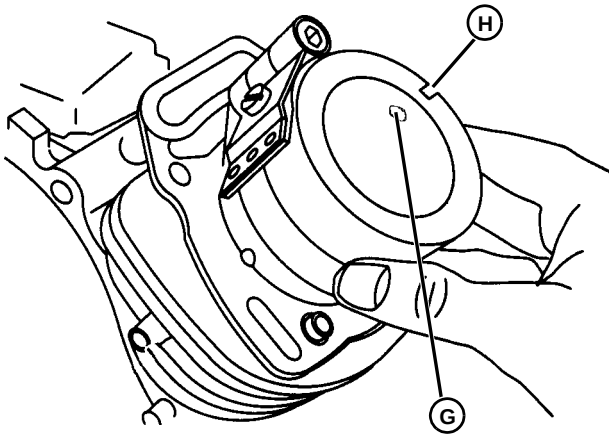
B

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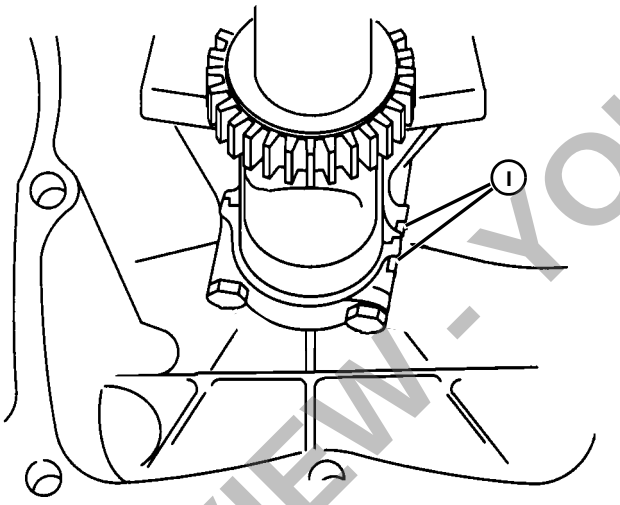
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M88932

15. Thoroughly clean and then oil cylinder bore.
16. Rotate crankshaft until crankpin journal is at bottom of stroke. This permits complete entry of compressed rings, piston and rod assembly, when pushed into cylinder.



M88933

17. Clean and oil crankshaft crankpin.
18. Pull connecting rod against crankpin.
19. Install rod cap with match marks (I) aligned.
20. Install connecting rod screws and tighten to **20.9 N•m (185 lb-in.)**.

NOTE: Failure to use a torque wrench can result in loose connecting rods causing breakage, or tight connecting rods causing scoring.

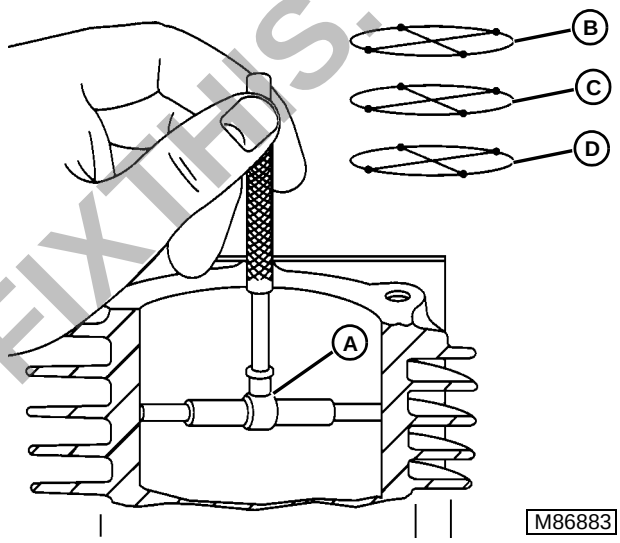
21. Rotate crankshaft two (2) revolutions to check for binding. Rod should also be free to slide sideways on crankpin.

Specifications:

Crankpin bearing . . . . . 31.80 mm (1.252 in.)
Piston pin bearing . . . . . 20.37 mm (0.802 in.)
Piston pin . . . . . 20.29 mm (0.799 in.)
Piston pin bore. . . . . 20.35 mm (0.801 in.)
Piston Pin Wear (max) . . . . . 0.01 mm (0.005 in.)
Connecting rod screws . . . . . 20.9 N•m (185 lb-in.)

CYLINDER BORE INSPECTION

Procedure:



M86883

1. Always inspect cylinder after engine has been disassembled. Visual inspection will show if there are any cracks, stripped bolt holes, broken fins or if the cylinder walls are damaged. Use a telescoping gauge, and dial caliper, or an inside micrometer (A) to determine the size of the cylinder bore. Measure at right angles at six points: top (B), center (C), and bottom (D).

Specifications:

Standard bore size (min.) . . 87.287 mm (3.4365 in.)
Standard bore size (max.) . . 87.312 mm (3.4375 in.)

2. If the cylinder bore is more than **0.08 mm (0.003 in.)** oversize, or **0.04 mm (0.0015 in.)** out of round, it must be resized, or replaced. See "RESIZING CYLINDER BORE".
3. If cylinder bores are within specification and show no signs of scoring or other damage, new pistons rings may be installed providing the cylinder bores are reconditioned using a rigid hone with finishing stones. This will restore the proper cross hatch angle in the cylinder bores. The proper cylinder cross hatch ensures proper lubrication and piston ring rotation.

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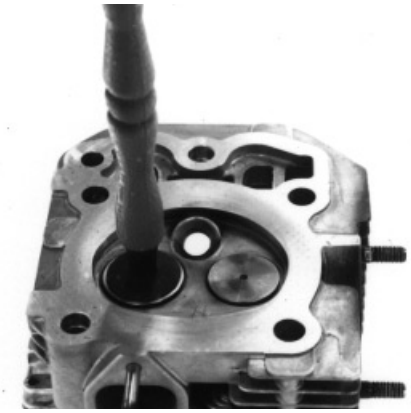
VALVES LAP

Special or Required Tools:

- Lapping Tool

Procedure:

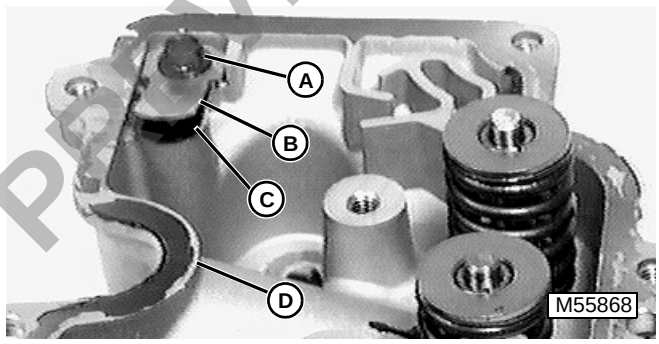
IMPORTANT: Valves and seats should be lapped if they do not make good contact.


M52134

1. Apply light coat of lapping compound to valve face, then turn valve in seat using vacuum cup tool.
2. Check valve every 8 strokes until a uniform ring appears around surface of valve face.
3. Wash parts in solvent to remove lapping compound.
4. Check position of lap mark on face–lap mark must be on or near center of valve face.

BREATHER INSPECTION

Procedure:



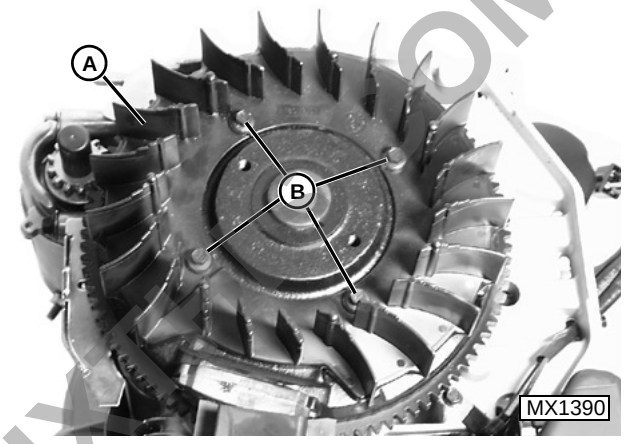
M55868

1. Remove cap screw (A), plate (B), and reed (C).
2. Check that breather opening is clear.
3. Replace reed if it does not lie flat on casting.
4. Clean mating surface of any sealant residue (D).

FLYWHEEL REMOVAL AND INSTALLATION

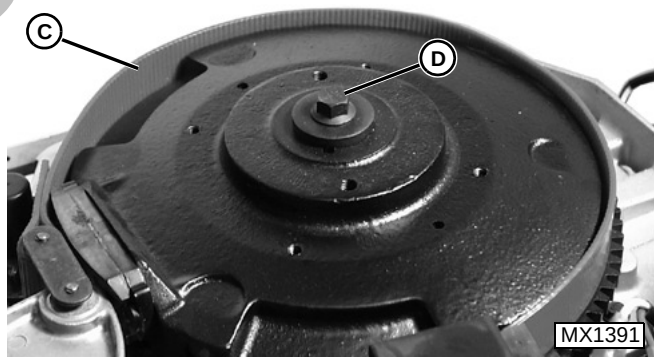
Procedure:

1. Remove blower housing sheet metal (see "BLOWER HOUSING REMOVAL & INSTALLATION").



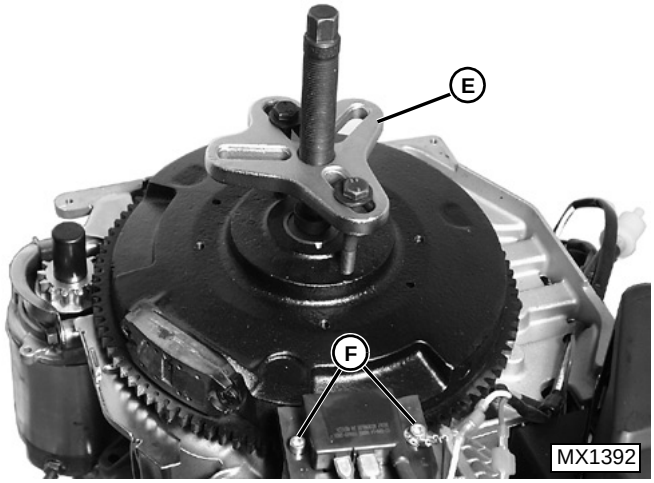
MX1390

2. Remove four fan cap screws (B) and fan (A).



MX1391

3. Hold flywheel with strap wrench (C). Remove cap screw (D) and washer.



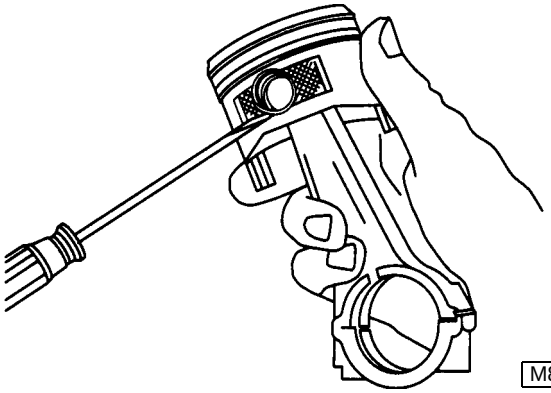
MX1392

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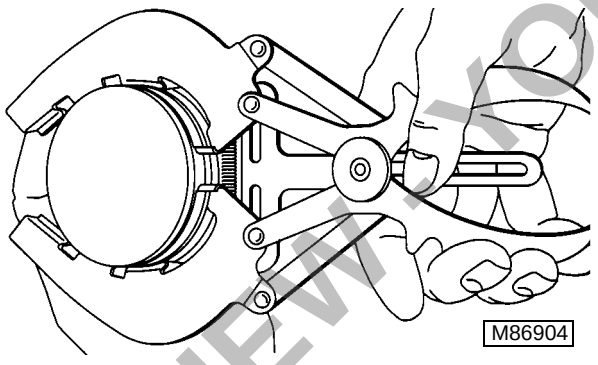
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NOTE: Remove any carbon or ridge at the top of the cylinder bore. This will prevent breaking the rings when removing the piston and connecting rod from the engine.

3. Remove the connecting rod cap. Then push the piston and connecting rod out through the top of the cylinder.


M87036

4. To remove connecting rod from piston, remove piston pin locks with screwdriver. Piston pin is a push fit in piston and rod. Deposits may build up on piston pin and require the piston pin to be pressed out.

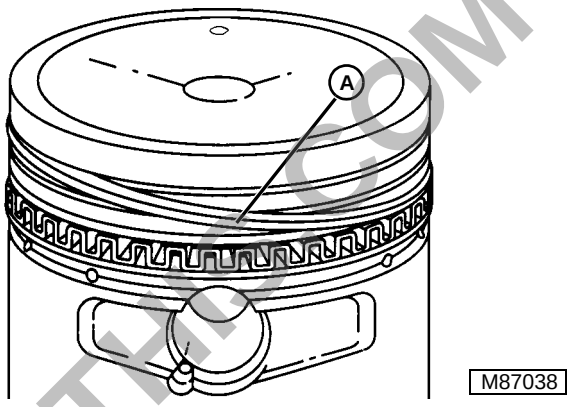

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IMPORTANT: Remove top and center compression rings using ring expander. New piston rings must be installed whenever the engine is disassembled for major servicing or overhaul, providing that cylinder bores are within specifications.

NOTE: Measure cylinder bores before checking pistons and rings. If cylinder bores require re-sizing it will not be necessary to check pistons and rings since a new oversized piston assembly will be used.

5. If cylinder bore is more than **0.08 mm (0.003 in.)** oversize, or **0.04 mm (0.0015 in.)** out of round, it must be resized.

IMPORTANT: When servicing pistons, rings, piston pins or rods, each rod, piston, piston pin and ring set must be kept as a set for the cylinder that it was removed from. Mark each set before removing from the engine.



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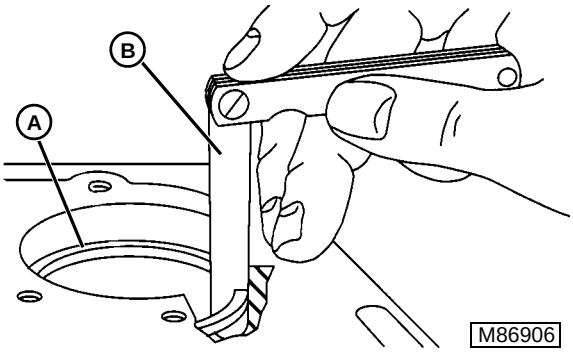
NOTE: Oil control ring (A) is shown being spiraled into compression ring groove.

6. Spiral top oil control ring from oil ring groove into center compression ring groove. Repeat into top compression ring groove, and then off piston. Repeat for bottom oil control ring.

NOTE: If the cylinder is to be resized, there is no reason to check the piston, since a new oversized piston assembly will be used. If however, the cylinder is not to be resized and the piston shows no signs of wear or scoring, the piston rings must be replaced.

Checking End Gap:

1. Insert old rings (A) one at a time approximately **25.4 mm (1.0 in.)** down into a cylinder bore.

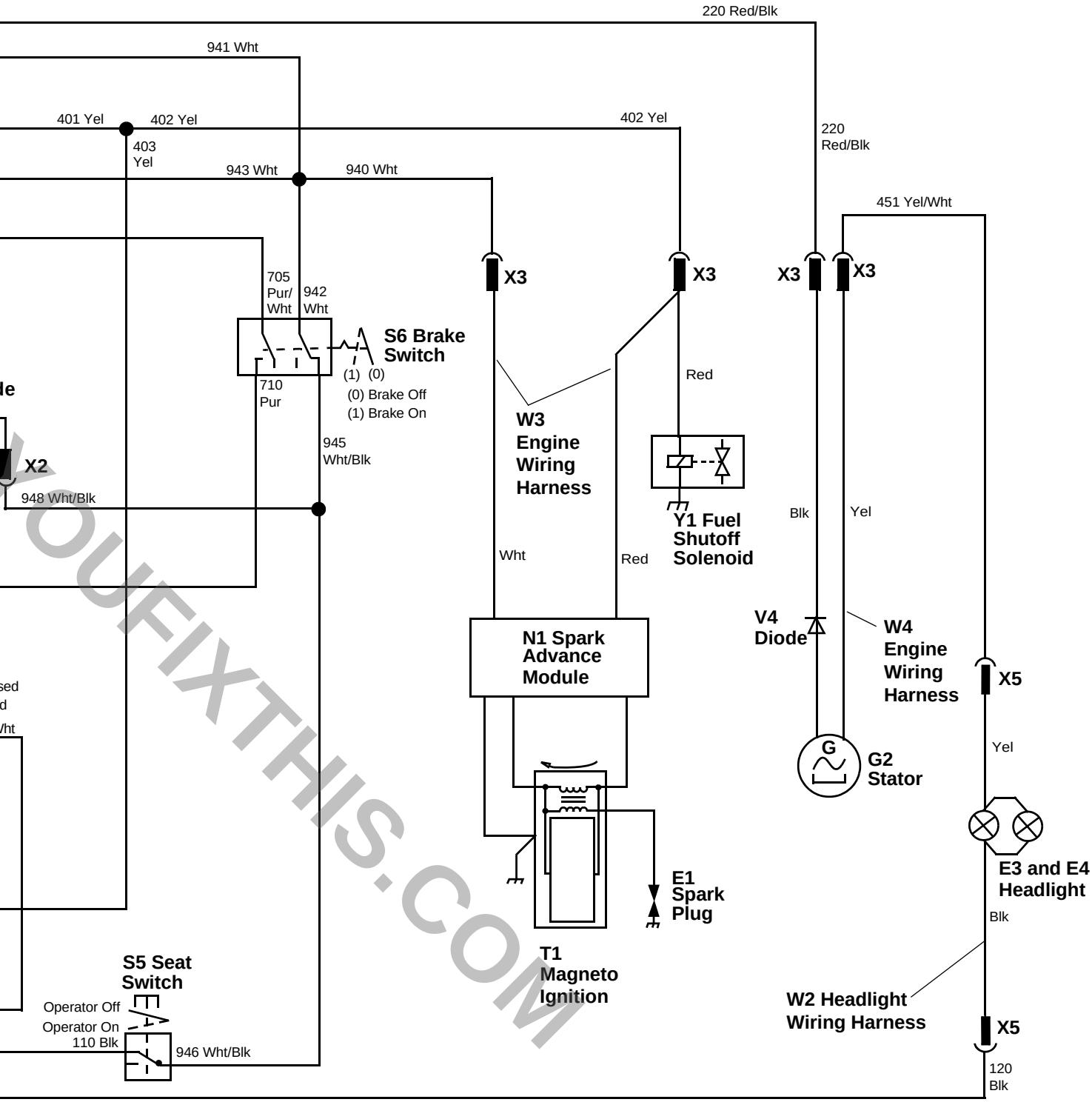


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2. Check end gap with feeler gauge (B). If ring end gap is greater than **0.76 mm (0.030 in.)** for compression and oil ring, the ring is worn and should be replaced.

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NETO KILL & START INTERLOCK	SE 3 - ENGINE	SE 4 - CHARGING	SE 5 - HEADLIGHTS

IGNITION AND SHUTOFF CIRCUIT OPERATION (S/N 035001–)

KOHLER WITHOUT STATOR BRAKE

Function:

To create a spark at the correct time that ignites the fuel/air mixture in the cylinder. To ground the system to keep the engine from starting or to shut off the engine.

Operating Conditions:

To produce a spark, the key switch must be in the START or RUN position. The operator can be ON or OFF the seat; however, the PTO must be disengaged and the brake switch must be ENGAGED (brake pedal pressed or park brake on) to start the engine.

To keep the engine running, the operator must be ON the seat to disengage the brake or engage the PTO.

NOTE: The spark advance module requires an external power source of at least 7 volts DC. If a replacement battery is installed, be certain that the battery is fully charged prior to installation.

Theory of Operation:

As the electric starter turns the flywheel, a magnet in the flywheel produces current in the primary coil of the ignition module by electromagnetic induction. When the primary current builds to its highest level, the spark advance module induces high voltage current pulse into the secondary coil. This high voltage current then flows to the spark plug, jumps the spark plug gap and creates a spark that ignites the fuel/air mixture, causing the engine to start and run. The engine is shut off by grounding the spark advance module which then stops producing voltage pulse for the ignition coil. With the spark advance module grounded, a spark cannot be produced.

The spark advance module will stop producing pulses for the spark plug if the 940 Wht wire from the coil is allowed to ground to the mower chassis.

The engine is shut off by grounding the spark advance module when:

- the operator turns the key switch to the OFF position
- the operator leaves the seat without locking the parking brake, and disengaging the PTO
- the operator places the tractor in reverse with the PTO engaged without first pressing the reverse implement switch (RIS).

Placing the key switch in the START or RUN position eliminates the path to ground for the Wht wire from the spark advance module, 940 and 941 Wht wires, key switch (S1) contacts (normally closed), to the 100 Blk wire and ground.

The second path to ground is eliminated if the operator is ON the seat (seat switch pressed); or, the operator is OFF the seat (seat switch released), and the brake switch is engaged and the PTO is disengaged. When the brake pedal is RELEASED, the brake switch (S6) connects 942 Wht wire from the 940 Wht wire and spark advance module, to the 945 and 946 Wht/Blk wires to the seat switch. When the operator is OFF the seat, the seat switch is released and the ground circuit contacts close. The 946 Wht/Blk wire is connected to ground through the seat switch and 110 Blk wire. The spark advance module prevents the spark plug from firing, shutting off the engine.

The PTO switch is in parallel with the brake switch, and will also ground the spark advance module when the PTO is engaged with no operator on the seat, shutting off the engine. This circuit connects the 940, 943 Wht wires through the PTO switch (S3) to the 949 Wht/Blk wire, 951 Blk/Wht wire, diode (V2), and 948 Wht/Blk wire into the 946 Wht/Blk wires. This circuit then functions the same as the brake circuit if the operator gets out of the seat.

A third path to ground will be created with engine running, if the operator places the tractor in reverse while the PTO is engaged and the Reverse Implement Switch (RIO) (S4) is not pressed.

With the PTO engaged, the path to ground is created for the Wht wire from the spark advance module, 940 and 943 Wht wires, PTO switch (S3) contacts (normally open), 949 and 950 Wht/Blk wires, RIO latch relay (K2) (normally closed), 957 Wht wire, RIO switch (S2) in reverse position, to the 130 Blk ground wire.

If engine will not shut off, check ground circuit. The engine is stopped by grounding the spark advance module through the key switch, the seat switch and the brake switch or PTO switch, or the RIO latch relay and RIO switch.

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TESTS AND ADJUSTMENTS

TRACTION DRIVE SYSTEM

Reason:

To ensure shift, neutral return, and brake linkages and belt drive system maintain traction in lower 1/3 of forward speed range up a 17° slope. To ensure that transport (free-wheeling) valve assembly and linkage allow tractor to be pushed when engaged and to drive tractor when disengaged. Also, to ensure tractor returns to neutral, engages the brake, stops tractor within specification, and holds tractor stationary in PARK position on a 17° slope or less.

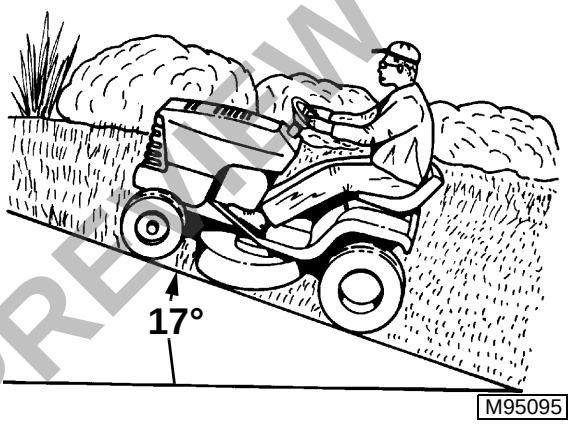
Procedure:

- Test drive on 17° slope,
- Drive belt adjustment,
- Transport valve linkage adjustment,
- Shift linkage adjustments,
- Brake rod adjustment,
- Repeat test drive on 17° slope.

Test Drive—

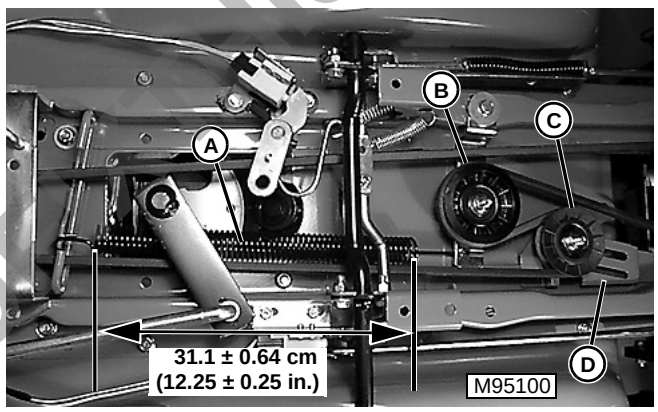
CAUTION

DO NOT accelerate or engage shift lever too aggressively or tractor may tip over backwards while performing the test drive on a 17° slope.



1. Test drive tractor to see if traction drive system pulls tractor up a 17° slope in lower 1/3 of forward range.
2. Look for a steady pull up the slope.
3. If test fails in any of the lower 1/3 range, the belt tension must be adjusted.
4. Drive or push tractor onto a 17° slope, depress the brake pedal and lock it inPARK position.
5. Shift lever and linkage must return-to-neutral, park brake must hold tractor stationary on slope, and tractor must not creep downward once park brake is locked into position.
6. Drive tractor on dry pavement in a safe, open, and level area at fast idle in full forward position. Apply a “panic stop” force (no more than 50 pounds of force) - tractor **must stop** within **0.9 – 1.5 m (3 – 5 ft)** and both wheels should **“lock-up”**, leaving skid marks on pavement.
7. Repeat Steps 4 - 6 for reverse.
8. If any test fails, the brake linkage and return-to-neutral linkage must be adjusted or components replaced.

DRIVE BELT ADJUSTMENT



1. Lock park brake.

CAUTION

Tensioning spring (A) is under high tension. Wear gloves and use a firm grip when stretching spring.

2. Measure length of tensioning spring (A). If measurement is to specification, belt tension is good. If tension spring length does not meet specification, proceed to step 3.

NOTE: If tractor does not pass traction drive tests and tensioning spring length meets specifications, replace belt.

Specification:

Spring Length (NOT including hooks)
. . . . . 31.1 ± 0.64 cm (12.25 ± 0.25 in.)

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